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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/072,164	02/07/2002	Mira Ben-Tzur	10002.000400 (PM01045)	1254
31894	7590	08/26/2004	EXAMINER	
OKAMOTO & BENEDICTO, LLP			MANDALA, VICTOR A	
P.O. BOX 641330			ART UNIT	
SAN JOSE, CA 95164			PAPER NUMBER	
			2826	

DATE MAILED: 08/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/072,164

Applicant(s)

BEN-TZUR ET AL.

Examiner

Victor A Mandala Jr.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 August 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 12-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>3/25/02</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election Restriction Response

1. Applicant's election of Group I in the reply filed on 8/23/02 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)). Claims 1-11 will be examined.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-7 and 9-11 are rejected under 35 U.S.C. 103(a) as being obvious over U.S.

Patent No. 6,413,852 Grill et al.

2. Referring to claim 1, a method of forming an interconnect line in an integrated circuit, the method comprising: depositing a sacrificial layer, (Figure 1j #120, 130, & 140), overlying a metallization level, (Figure 1d #185 and 170); forming an opening, (Figure 1c #150 & Col. 6 Lines 61-62), in the sacrificial layer, (Figure 1j #120, 130, & 140); depositing a metal, (Figure 1D #180), in the opening, (Figure 1c #150 & Col. 6 Lines 61-62), the metal, (Figure 1D #180), being coupled to an interconnect line in the metallization level, (Figure 1d #185 and 170); and etching the sacrificial layer, (Figure 1j #220 & See *below), using a chemistry that includes a

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noble gas fluoride, (Col. 7 Lines 37-47), to create an air core, (Figure 1N #270), overlying the metallization level, (Figure 1d #185 and 170).

* The prior art teaches a sacrificial layer that is deposited and etched to form vias and then fill in with metal to form a contact, the prior art then removes the sacrificial layer and then deposits another sacrificial layer that will later be etched to form the air gaps. It would be obvious to one having ordinary skill in the art at the time the invention was made to make the first sacrificial layer to be the same as the second since Grill et al. makes both sacrificial layers out of the same material.

3. Referring to claim 2, a method further comprising the act of planarizing, (Col. 5 Lines 35-40), the metal prior to exposing the sacrificial layer, (Figure 1j #120, 130, & 140).

4. Referring to claim 3, a method further comprising the act of depositing a topside layer, (Figure 1O #280), overlying the air core, (Figure 1N #270).

5. Referring to claim 4, a method further comprising the act of depositing a capping layer, (Figure 1M #250), overlying the sacrificial layer, (Figure 1j #120, 130, & 140), prior to forming an opening in the sacrificial layer, (Figure 1j #120, 130, & 140).

6. Referring to claim 5, a method, wherein the sacrificial layer, (Figure 1j #120, 130, & 140), is deposited overlying a support layer, (Figure 1j #110).

7. Referring to claim 6, a method, wherein the opening includes a via, (Figure 1c #150 & Col. 6 Lines 61-62).

8. Referring to claim 7, a method, wherein the metal includes copper, (Col. 5 Lines 41-43).

9. Referring to claim 9, a method, wherein the sacrificial layer, (Figure 1j #110, 120, 130, & 140), includes polycrystalline silicon, (Col. 4 Lines 63-67 and Col. 5 Lines 1-19).

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10. Referring to claim 10, a method, wherein the capping layer, (Figure 1M #250), includes silicon nitride, (Col. 7 Lines 10-14).

11. Referring to claim 11, a method, wherein the metallization level, (, (Figure 1d #185 and 170), includes a damascene structure, (Cu and W).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 8 is rejected under 35 U.S.C. 103(a) as being obvious over U.S. Patent No. 6,413,852 Grill et al. in view of U.S. Patent No. 6,355,498 Chan et al.

12. Referring to claim 8, a method, wherein the noble gas fluoride includes xenon difluoride, Chan et al. Col. 3 Lines 15-21).

Grill et al. discloses the claimed invention except for the specific etchant of xenon difluoride, but Chan et al. does. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use xenon difluoride as an etchant, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Victor A Mandala Jr. whose telephone number is (571) 272-1918. The examiner can normally be reached on Monday through Thursday from 8am till 6pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on (571) 272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

NATHAN J. FLYNN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

VAMJ
8/12/04